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**Joint Polar Satellite System (JPSS)
Algorithm Specification Volume I:
Software Requirement Specification (SRS)
for the ATMS RDR/TDR/SDR**



National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirement Specification (SRS) for the ATMS RDR/TDR/SDR JPSS Review/Approval Page

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Preface

This document is under JPSS Ground Project configuration control. Once this document is approved, JPSS approved changes are handled in accordance with Class I and Class II change control requirements as described in the JPSS Configuration Management Procedures, and changes to this document shall be made by complete revision.

Any questions should be addressed to:

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Change History Log

Revision	Effective Date	Description of Changes (Reference the CCR & CCB/ERB Approve Date)
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A	Jan 16, 2014	This version incorporates 474-CCR-13-1412 and 474-CCR-13-1360 which was approved by the JPSS Ground ERB on the effective date shown.
A1	Oct 23, 2014	This version incorporates 474-CCR-14-2091 which was approved by the JPSS Ground ERB for CO10 on the effective date shown.
B	Aug 13, 2014	This version incorporates 474-CCR-14-1721, 474-CCR-14-1741, 474-CCR-14-1793, 474-CCR-14-1781 and 474-CCR-14-1865 which was approved by the JPSS Ground ERB on the effective day shown.
C	Feb. 26, 2015	This version incorporates 474-CCR-14-2110 and 474-CCR-15-2289 which was approved by the JPSS Ground ERB on the effective day shown.
D	Jan 19, 2016	This version incorporates 474-CCR-15-2452 and 474-CCR-15-2480, 474-CCR-15-2657, and 474-CCR-15-2745 which was approved by JPSS Ground ERB on the effective date shown.

List of TBx Items

TBx	Type	ID	Text	Action
None				

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1 Introduction

The Joint Polar Satellite System (JPSS) is the National Oceanic and Atmospheric Administration's (NOAA) next-generation operational Earth observation program that acquires and distributes global environmental data primarily from multiple polar-orbiting satellites. The program plays a critical role in NOAA's mission to understand and predict changes in weather, climate, oceans and coasts, and the space environment, which support the Nation's economy and protect lives and property. The first JPSS satellite mission, the Suomi National Polar-orbiting Partnership (S-NPP) satellite, successfully launched in October 2011. S-NPP, along with the legacy NOAA Polar Operational Environmental Satellites (POES), provides continuous environmental observations. Two JPSS satellites will follow S-NPP: JPSS-1, planned for launch in fiscal year (FY) 2017, with JPSS-2 to follow in FY2022.

In addition to the JPSS Program's own satellites operating in the 1330 (± 10) Local Time of the Ascending Node (LTAN) orbit, NOAA also leverages mission partner assets for complete global coverage. These partner assets include the Department of Defense (DoD) Defense Meteorological Satellite Program (DMSP) operational weather satellites (in the 1730 - 1930 LTAN orbit), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) Meteorological Operational (Metop) satellites (in the 2130 LTAN orbit) and the Japanese Aerospace Exploration Agency (JAXA) Global Change Observation Mission-Water (GCOM-W) satellite (in the 1330 LTAN orbit). JPSS routes Metop data from McMurdo Station, Antarctica to the EUMETSAT facility in Darmstadt, Germany and EUMETSAT, in turn, provides Metop data to NOAA. For GCOM, JPSS routes the GCOM-W data from Svalbard, Norway through the NOAA Satellite Operations Facility (NSOF) in Suitland, MD, processes GCOM-W data and delivers GCOM-W products to the JPSS users who have JAXA permissions.

Additionally, the JPSS Program provides data acquisition and routing support to the DMSP and the WindSat Coriolis Program. JPSS routes DMSP data from McMurdo Station to the 557th Weather Wing at Offutt Air Force Base in Omaha, NE. After processing, the 557th releases the DMSP data for public consumption over the Internet via the National Geophysical Data Center in Boulder, CO. The JPSS Program provides data routing support to the National Science Foundation (NSF), as well as the National Aeronautics and Space Administration (NASA) Space Communications and Navigation (SCaN)-supported missions, which include the Earth Observing System (EOS). As part of the agreements for the use of McMurdo Station, JPSS provides communications/network services for the NSF between McMurdo Station, Antarctica and Centennial, Colorado.

As a multi-mission ground infrastructure, the JPSS Ground System supports the heterogeneous constellation of the before-mentioned polar-orbiting satellites both within and outside the JPSS Program through a comprehensive set of services as listed in Table 1-1.

Table: 1-1 JPSS Ground System Services

Service	Description
Enterprise Management and Ground Operations	Provides mission management, mission operations, ground operations, contingency management and system sustainment
Flight Operations	Provides launch support and early orbit operations, telemetry and commanding, orbital operations, mission data playback, payload support, flight software upgrade, flight vehicle simulation, and disposal at the end of mission life
Data Acquisition	Provides space/ground communications for acquiring mission data
Data Routing	Provides routing of telemetry, mission and/or operations data through JPSS' global data network
Data Product Generation	Provides the processing of mission data to generate and distribute raw, sensor, environmental, and ancillary data products
Data Product Calibration and Validation	Provides calibration and validation of the data products
Field Terminal Support	Provides development and operational support to the Field Terminal customers

1.1 Identification

The Advanced Technology Microwave Sounder (ATMS), together with the Crosstrack Infrared Sounder (CrIS) — a high spectral resolution IR spectrometer — are designed to meet the measurement requirements set for the Joint Polar-orbiting Satellite System (JPSS) as well as satisfy the climate research objectives of the National Aeronautics and Space Administration (NASA). ATMS and CrIS Sensor Data Records are used to support the generation of downstream Atmospheric Vertical Moisture Profile and Atmospheric Vertical Temperature Profile products. S-NPP serves the two functions of providing risk reduction for JPSS and providing science data continuity between the NASA Terra and Aqua missions (the latter being the first mission to carry a high resolution sounding suite) on one hand and JPSS on the other. For that reason, the S-NPP mission has sometimes been called the “bridging mission”.

Additionally, while JPSS is primarily designed to support operational weather forecasting needs, NASA has a strong interest in research and climate applications, and an effort is under way to determine how JPSS can satisfy those needs. Thus, the third function of S-NPP is to serve as a test bed for transforming weather satellite data to climate research quality data.

ATMS is a 22-channel microwave sounder providing both temperature soundings - between the surface and the upper stratosphere (i.e. to about 1 mb, at an altitude of about 45 km) - and humidity soundings - between the surface and the upper troposphere (i.e. to about 200 mb, at an altitude of about 15 km). Like AMSU, it is a crosstrack scanner. There are two receiving antennas — one serving 15 channels below 60 GHz (with a beam width of 2.2° for all except the lowest two channels) and one serving 7 channels above 60 GHz (with a beam width of 1.1° for all except the lowest channel). The antennas consist of plane reflectors mounted on a scan axis at a 45° tilt angle, so that radiation is reflected from a direction perpendicular to the scan axis into a direction along the scan axis (i.e. a 90° reflection). With the scan axis oriented in the along-track direction, this results in a cross-track scan pattern. The reflected radiation is in each case focused by a stationary parabolic reflector onto a dichroic plate and from there either reflected to or passed through to a feedhorn. Each aperture/reflector therefore serves two frequency bands, for a total of four bands. Thus, radiation from a direction within the scan plane, which depends on the angle of rotation of the reflector, is reflected and focused onto the receiver apertures — conical feedhorns.

1.2 Algorithm Overview

The algorithms described in this document are very similar to those that have been developed by NOAA and NASA for the AMSU-A and -B instruments, which have flown since 1998 (NOAA) and 2002 (NASA), respectively. Details of the description are based on preliminary software developed by the ATMS contractor, NGES, and delivered in mid-2004 as version 2.2. Since the basic functionalities and principles of operation of these instruments are quite similar, the differences between the respective algorithmic approaches are relatively minor. For example, while NOAA prefers to convert radiometer measurements to physical radiance units ($\text{mW/m}^2\text{-sr-cm}^{-1}$), the approach of NASA is to convert to brightness temperature units (K) instead, which is the most common practice in the microwave field.

The following steps describe the on-board calibration measurements used to determine the calibration coefficients.

1. Determine the blackbody brightness temperature, from its physical temperature as measured by the embedded PRT's and a possibly temperature dependent bias correction.
2. Estimate the cold-space view brightness temperature, taking into account earth radiation into the antenna sidelobes and a correction to the Rayleigh-Jeans approximation.
3. Average the blackbody and cold-space radiometer counts, measured in a calibration cycle (i.e. up to 4 values) and smooth the averages over several calibration cycles.
4. Determine the radiometer gain.
5. Estimate a scene brightness temperature from the linear approximation.
6. Use the linear approximation to estimate the relative brightness temperature.
7. Estimate the radiometer nonlinearity amplitude, possibly based on a measured instrument temperature.
8. Compute a quadratic correction of the brightness temperature

This implicit transfer function is applied to the earth-scene radiometer counts for one scan cycle.

1.3 Document Overview

Section	Description
Section 1	Introduction - Provides a brief overview of the JPSS Ground System and the relevant algorithm, as reference material only.
Section 2	Related Documentation - Lists related documents and identifies them as Parent, Applicable, or Information Documents such as, MOAs, MOUs, technical implementation agreements, as well as Data Format specifications. This section also establishes an order of precedence in the event of conflict between two or more documents.
Section 3	Algorithm Requirements - Provides a summary of the science requirements for the products covered by this volume.
Appendix A	Requirements Attributes - Provides the mapping of requirements to verification methodology and attributes.

2 Related Documentation

The latest JPSS documents can be obtained from URL:

https://jpssmis.gsfc.nasa.gov/frontmenu_dsp.cfm. JPSS Project documents have a document number starting with 470, 472 or 474 indicating the governing Configuration Control Board (CCB) (Program, Flight, or Ground) that has the control authority of the document.

2.1 Parent Documents

The following reference document(s) is (are) the Parent Document(s) from which this document has been derived. Any modification to a Parent Document will be reviewed to identify the impact upon this document. In the event of a conflict between a Parent Document and the content of this document, the JPSS Program Configuration Change Board has the final authority for conflict resolution.

Doc. No.	Document Title
470-00067	Joint Polar Satellite System (JPSS) Ground System Requirements Document (GSRD)
470-00067-02	Joint Polar Satellite System (JPSS) Ground System Requirements Document (GSRD), Vol. 2 - Science Product Specification
474-00448-01-01	Joint Polar Satellite System (JPSS) Algorithm Specification Volume I: Software Requirements Specification (SRS) for the Common Algorithms

2.2 Applicable Documents

The following document(s) is (are) the Applicable Document(s) from which this document has been derived. Any modification to an Applicable Document will be reviewed to identify the impact upon this document. In the event of conflict between an Applicable Document and the content of this document, the JPSS Program Configuration Change Board has the final authority for conflict resolution.

Doc. No.	Document Title
D0001-M01-S01-001	Joint Polar Satellite System (JPSS) Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (ATBD)
474-00448-04-02	Joint Polar Satellite System (JPSS) Algorithm Specification Volume IV: Software Requirements Specification Parameter File (SRSPF) for the ATMS RDR/TDR/SDR
474-00448-02-02	Joint Polar Satellite System (JPSS) Algorithm Specification Volume II: Data Dictionary for the ATMS RDR/TDR/SDR

2.3 Information Documents

The following documents are referenced herein and amplify or clarify the information presented in this document. These documents are not binding on the content of this document.

Doc. No.	Document Title
474-00333	Joint Polar Satellite System (JPSS) Ground System (GS) Architecture Description Document (ADD)
474-00054	Joint Polar Satellite System (JPSS) Ground System (GS) Concept of Operations

Doc. No.	Document Title
	(ConOps)
470-00041	Joint Polar Satellite System (JPSS) Program Lexicon
474-00448-03-02	Joint Polar Satellite System (JPSS) Algorithm Specification Volume III: Operational Algorithm Description (OAD) for ATMS RDR/TDR/SDR
429-05-02-42	Joint Polar Satellite System (JPSS) Mission Data Format Control Book for NPP
472-00251	Joint Polar Satellite System (JPSS) Mission Data Format Control Book for JPSS-1
472-00334	Joint Polar Satellite System-1 (JPSS-1) Advanced Technology Microwave Sounder (ATMS) Mission Data Packet Structures

3 Algorithm Requirements

3.1 States and Modes

3.1.1 Normal Mode Performance

SRS.01.02_43 The ATMS TDR software shall calculate antenna temperatures with the per channel antenna temperature accuracy limits of 1 deg K for channels 1-2 and channels 16-22; 0.75 K for channels 3-15.

Rationale: The channel antenna accuracy limits were flowed down from the JPSS Program Level 1 and 2 requirements.

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_85 The ATMS SDR software shall calculate brightness temperatures with the per channel brightness temperature accuracy limits of 1 deg K for channels 1-2 and channels 16-22; 0.75 K for channels 3-15.

Rationale: The channel brightness temperature accuracy limits were flowed down from the JPSS Program Level 1 and Level 2 requirements.

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_87 The ATMS SDR software shall calculate the warm noise equivalent differential temperature (NeDT) with the per channel 300K NeDT limits of 0.7 deg K for channels 1 and 4-9; 0.8 K for channels 2 and 18-21; 0.9 K for channels 3 and 22; 0.75 K for channel 10; 1.2 K for channels 11-12; 1.5 K for channel 13; 2.4 K for channel 14; 3.6 K for channel 15; 0.5 K for channel 16; and 0.6 K for channel 17.

Rationale: The requirement was derived from the JPSS Program Level 1 and Level 2 requirements.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_739 The ATMS TDR software shall calculate antenna temperatures with a dynamic range of 0-330 Kelvin at all channels.

Rationale: The antenna temperature dynamic range was flowed down from the JPSS Program Level 1 and 2 requirements.

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_79 The ATMS TDR software shall deliver effective fields of view along track of 5.2 deg for channels 1 and 2; 2.2 deg for channels 3-16; and 1.1 deg for channels 17-22.

Rationale: The along-track Effective Field of Views (EFOV) for channels were flowed down from the JPSS program Level 1 and 2 requirements.

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_738 The ATMS TDR software shall deliver effective fields of view cross-track of 6.3 deg for channels 1 and 2; 3.3 deg for channels 3-16; and 2.2 deg for channels 17-22.

Rationale: The cross-track Effective Field of Views (EFOV) for channels were flowed down from the JPSS Program Level 1 and 2 requirements.

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_864 The ATMS SDR Geolocation algorithm computation shall have a 3 sigma mapping uncertainty of 5 km.

Rationale: From LIRD requirements for ATMS Imagery.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.1.2 Graceful Degradation Mode Performance

Not applicable.

3.2 Algorithm Functional Requirements

3.2.1 Product Production Requirements

Not applicable.

3.2.2 Algorithm Science Requirements

SRS.01.02_41 The ATMS TDR software shall incorporate a computing algorithm provided for antenna temperatures.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_44 The ATMS TDR software shall incorporate a computing algorithm provided for evaluating the effect of the moon on the space view calibration.

Rationale: The algorithm through its' computing software must take the moon intrusion (contamination) into consideration for the cold space view calibration because it increases the space view brightness temperature. Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_83 The ATMS SDR software shall incorporate a computing algorithm provided for brightness temperatures.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_86 The ATMS SDR software shall incorporate a computing algorithm provided for warm NeDT values.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_89 The ATMS SDR software shall incorporate a computing algorithm provided for cold NeDT values.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_91 The ATMS SDR software shall incorporate a computing algorithm provided for gain values.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: JPSS-1, JPSS-2

SRS.01.02_93 The ATMS SDR software shall incorporate a computing algorithm provided for evaluating the effect of the moon on the space view calibration.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001).

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_737 The ATMS TDR software shall incorporate a computing algorithm provided for calibrated radiances.

Rationale: Algorithm to be in accordance with Advanced Technology Microwave Sounder (ATMS) SDR Radiometric Calibration Algorithm Theoretical Basis Document (D0001-M01-S01-001). This requirement ensures that the calibration in the TDR algorithm is carried out in radiance space instead of the temperature space.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.2.3 Algorithm Exception Handling

SRS.01.02_45 The ATMS TDR software shall set <FillField> to indicated <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <TDR><fill>.

Rationale: The algorithm through its' computing software must fill the TDR values based on the established fill conditions to satisfy exclusion and fill conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_95 The ATMS SDR software shall set <FillField> to indicated <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <SDR><fill>.

Rationale: The algorithm through its' computing software must fill the SDR values based on the established fill conditions to satisfy exclusion and fill conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.3 External Interfaces

3.3.1 Inputs

SRS.01.02_48 The ATMS TDR software shall incorporate inputs specified in Table 3.3.1-1.

Rationale: The details of the RDR and AP formatting and how to extract the data is contained with the relevant spacecraft Mission Data Format Control Book (429-05-02-42 for S-NPP & 472-00251 for JPSS-1).

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_99 The ATMS SDR software shall incorporate inputs specified in Table 3.3.1-1.

Rationale: The ATMS SDR generation software must be able to receive and process the resource interaction items shown in Table 3.3.1-1 in order to produce the intended ATMS SDR products.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_157 The ATMS SDR geolocation software shall incorporate inputs per Table 3.3.1-1.

Rationale: The ATMS SDR geolocation software must be able to receive and process the resource interaction items shown in Table 3.3.1-1 in order to produce the intended ATMS SDR geolocation products.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_862 The ATMS SDR software shall ingest tables and coefficients formatted in accordance with Section 7 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).

Rationale: This defines the formats for Lookup Tables, and Processing Coefficients for input into the algorithm module.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

Table 3.3.1-1 and Figure 3.3.1-1 are best viewed together since they describe the processes governed by this SRS in different ways. The figure diagrams the data flowing into, out of, and within the code governed by this SRS. The table lists these same data interactions as well as all downstream dependencies for outputs from this SRS.

Each row in the table describes a single software interaction - data flowing from one software item to another. The data is listed in the first column. The second and third columns include the short name or mnemonic for the data. Blanks indicate there is no mnemonic. The fourth and fifth columns contain the SRS that generates the data product(s) in the first column, and the SRS that receives those products. The final two columns contain the actual function name in Algorithm Development Library (ADL) that produces those products, and the function that inputs those products. The SRS's titled "Ingest MSD" and "Store/Retrieve" are non-existent SRS's functioning as data handling for the IDPS. The software functions "Store Products" and "Retrieve Products" are similar non-existent functions that operate as IDPS data handling.

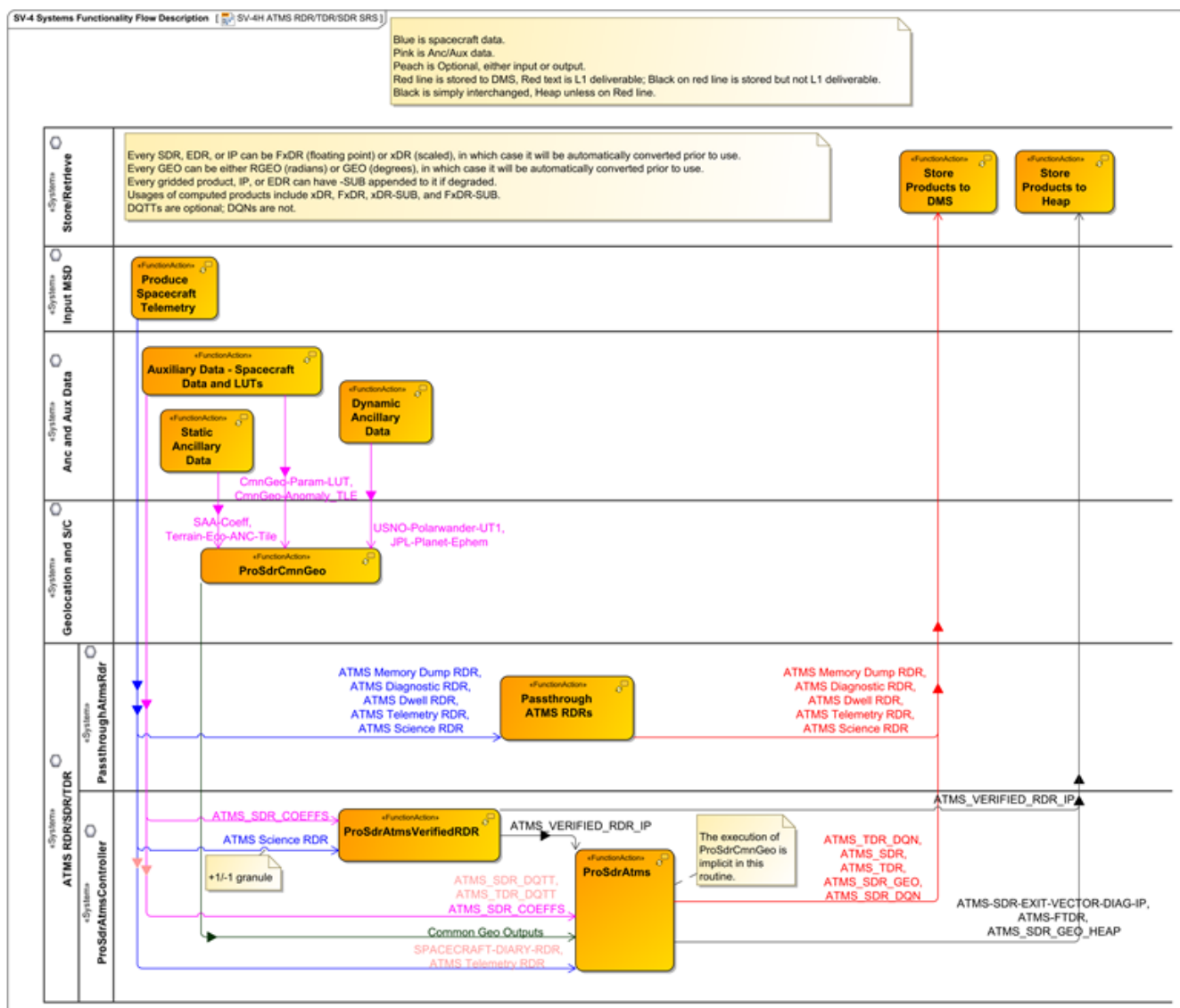


Figure: 3.3.1-1 ATMS RDR/TDR/SDR Data Flows

Table: 3.3.1-1 Systems Resource Flow Matrix: ATMS RDR/TDR/SDR

Data Product Name	Collection Short Name	Mnemonic	Sending SRS	Receiving SRS	Sending Function	Receiving Function
<ul style="list-style-type: none"> •ATMS Memory Dump RDR •ATMS Diagnostic RDR •ATMS Dwell RDR •ATMS Telemetry RDR •ATMS Science RDR 	<ul style="list-style-type: none"> •ATMS-DUMP-RDR •ATMS-DIAGNOSTIC-RDR •ATMS-DWELL-RDR •ATMS-TELEMETRY-RDR •ATMS-SCIENCE-RDR 	<ul style="list-style-type: none"> •RDRE-ATMS-C0035 •RDRE-ATMS-C0032 •RDRE-ATMS-C0036 •RDRE-ATMS-C0031 •RDRE-ATMS-C0030 	Input MSD	ATMS RDR/SDR/TDR	Produce Spacecraft Telemetry	Passthrough ATMS RDRs
•ATMS Science RDR	•ATMS-SCIENCE-RDR	•RDRE-ATMS-C0030	Input MSD	ATMS RDR/SDR/TDR	Produce Spacecraft Telemetry	ProSdrAtmsVerifiedRDR
<ul style="list-style-type: none"> •SPACECRAFT-DIARY-RDR •ATMS Telemetry RDR 	<ul style="list-style-type: none"> •SPACECRAFT-DIARY-RDR •ATMS-TELEMETRY-RDR 	<ul style="list-style-type: none"> •RDRE-SCAE-C0030 •RDRE-ATMS-C0031 	Input MSD	ATMS RDR/SDR/TDR	Produce Spacecraft Telemetry	ProSdrAtms
•ATMS_SDR_COEFFS	•ATMS-SDR-CC	•DP_NU-L00020-020	Anc and Aux Data	ATMS RDR/SDR/TDR	Auxiliary Data - Spacecraft Data and LUTs	ProSdrAtms
•ATMS_SDR_COEFFS	•ATMS-SDR-CC	•DP_NU-L00020-020	Anc and Aux Data	ATMS RDR/SDR/TDR	Auxiliary Data - Spacecraft Data and LUTs	ProSdrAtmsVerifiedRDR
<ul style="list-style-type: none"> •ATMS_SDR_DQTT •ATMS_TDR_DQTT 	<ul style="list-style-type: none"> •ATMS-SDR-DQTT •ATMS-TDR-DQTT 	<ul style="list-style-type: none"> •DP_NU-LM2030-000 •DP_NU-LM2030-000 	Anc and Aux Data	ATMS RDR/SDR/TDR	Auxiliary Data - Spacecraft Data and LUTs	ProSdrAtms
•Common Geo Outputs	•None	•None	Geolocation and S/C	ATMS RDR/SDR/TDR	ProSdrCmnGeo	ProSdrAtms
•ATMS_VERIFIED_RDR_IP	•ATMS-Verified-RDR-IP	•None	ATMS RDR/SDR/TDR	ATMS RDR/SDR/TDR	ProSdrAtmsVerifiedRDR	ProSdrAtms

Data Product Name	Collection Short Name	Mnemonic	Sending SRS	Receiving SRS	Sending Function	Receiving Function
<ul style="list-style-type: none"> •ATMS-SDR-EXIT-VECTOR-DIAG-IP •ATMS-FTDR •ATMS_SDR_GEO_HEAP 	<ul style="list-style-type: none"> •ATMS-SDR-EXIT-VECTOR-DIAG-IP •ATMS-FTDR •ATMS-SDR-GEO-HEAP 	<ul style="list-style-type: none"> •None •None •None 	ATMS RDR/SDR/TDR	Store/Retrieve	ProSdrAtms	Store Products to Heap
•ATMS_VERIFIED_RDR_IP	•ATMS-Verified-RDR-IP	•None	ATMS RDR/SDR/TDR	Store/Retrieve	ProSdrAtmsVerifiedRDR	Store Products to Heap
<ul style="list-style-type: none"> •ATMS_SDR_IP •ATMS-FSDR 	<ul style="list-style-type: none"> •ATMS-SDR-IP •ATMS-FSDR 	<ul style="list-style-type: none"> •None •None 	ATMS RDR/SDR/TDR	Store/Retrieve	ProSdrAtms	Store Products to DMS
<ul style="list-style-type: none"> •ATMS Memory Dump RDR •ATMS Diagnostic RDR •ATMS Dwell RDR •ATMS Telemetry RDR •ATMS Science RDR 	<ul style="list-style-type: none"> •ATMS-DUMP-RDR •ATMS-DIAGNOSTIC-RDR •ATMS-DWELL-RDR •ATMS-TELEMETRY-RDR •ATMS-SCIENCE-RDR 	<ul style="list-style-type: none"> •RDRE-ATMS-C0035 •RDRE-ATMS-C0032 •RDRE-ATMS-C0036 •RDRE-ATMS-C0031 •RDRE-ATMS-C0030 	ATMS RDR/SDR/TDR	Store/Retrieve	Passthrough ATMS RDRs	Store Products to DMS
<ul style="list-style-type: none"> •ATMS_TDR_DQN •ATMS_SDR •ATMS_TDR •ATMS_SDR_GEO •ATMS_SDR_DQN 	<ul style="list-style-type: none"> •ATMS-TDR-DQN •ATMS-SDR •ATMS-TDR •ATMS-SDR-GEO •ATMS-SDR-DQN 	<ul style="list-style-type: none"> •DP_NU-L00090-001 •SDRE-ATMS-C0030 •TDRE-ATMS-C0030 •None •DP_NU-L00090-001 	ATMS RDR/SDR/TDR	Store/Retrieve	ProSdrAtms	Store Products to DMS

3.3.2 Outputs

SRS.01.02_47 The ATMS TDR software shall generate the ATMS TDR product in conformance with the XML format file in Attachment A.5 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).

Rationale: The product profile must conform to the XML format file.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_98 The ATMS SDR software shall generate the ATMS SDR product in conformance with the XML format file in Attachment A.4 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).

Rationale: The product profile must conform to the XML format file.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_138 The ATMS RDR software shall generate the ATMS Science RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Science>.

Rationale: The Science RDR is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_139 The ATMS RDR software shall generate the ATMS Diagnostic RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Diagnostic>.

Rationale: The Diagnostic RDR is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_140 The ATMS RDR software shall generate the ATMS Dwell RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Dwell>.

Rationale: The Dwell RDR is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_141 The ATMS RDR software shall generate the ATMS Telemetry RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Telemetry>.

Rationale: The Telemetry RDR is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_142 The ATMS RDR software shall generate the ATMS Memory Dump RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><MemoryDump>.

Rationale: The Memory Dump RDR is generated from the specified mission data packet APIDs. APIDs associated with the Spacecraft Diary, as defined in the JPSS Algorithm Specification Vol IV: SRS Parameter File for Geolocation and Spacecraft Orientation (474-00448-04-08), are included in the deliverable RDR.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_153 The ATMS TDR software shall use the ATMS SDR geolocation.

Rationale: The geolocation product must be generated with the TDR product.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_155 The ATMS SDR software shall generate the SDR geolocation product in conformance with the XML format file in Attachment A.3 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).

Rationale: The product profile must conform to the XML format file.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.4 Science Standards

Not applicable.

3.5 Metadata Output

3.6 Quality Flag Content Requirements

SRS.01.02_54 The ATMS TDR software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <TDR><QF>.

Rationale: Quality Flags must be generated based on the established flag conditions, logic, and format.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_105 The ATMS SDR software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV, SRSPF for ATMS RDR/TDR/SDR , (474-00448-04-02) <SDR><QF>.

Rationale: Quality Flags must be generated based on the established flag conditions, logic, and format.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_161 The ATMS SDR geolocation software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <SDR_GEO><QF>.

Rationale: Quality Flags must be generated based on the established flag conditions, logic, and format.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.7 Data Quality Notification Requirements

SRS.01.02_50 The ATMS TDR software shall send data quality notifications to the operator according to logic specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <TDR> <Notifications>.

Rationale: Notifications must be generated and sent based on the established logic and conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_101 The ATMS SDR software shall send data quality notifications to the operator according to logic specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <SDR> <Notifications>.

Rationale: Notifications must be generated and sent based on the established logic and conditions.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.8 Adaptation

Not applicable.

3.9 Provenance Requirements

Not applicable.

3.10 Computer Software Requirements

Not applicable.

3.11 Software Quality Characteristics

Not applicable.

3.12 Design and Implementation Constraints

SRS.01.02_731 The JPSS Common Ground System shall execute the ATMS TDR algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_732 The JPSS Common Ground System shall execute the ATMS SDR algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

SRS.01.02_735 The JPSS Common Ground System shall execute the ATMS SDR geolocation algorithm.

Rationale: The CGS must incorporate algorithm changes that are supplied by the algorithm vendor.

Mission Effectivity: S-NPP, JPSS-1, JPSS-2

3.13 Personnel Related Requirements

Not applicable.

3.14 Training Requirements

Not applicable.

3.15 Logistics Related requirements

Not applicable.

3.16 Other Requirements

Not applicable.

3.17 Packaging Requirements

Not applicable.

3.18 Precedence and Criticality

Not applicable.

Appendix A. Requirements Attributes

The Requirements Attributes Table lists each requirement with CM-controlled attributes including requirement type, mission effectivity, requirement allocation(s), block start and end, method(s) for verifying each requirement, etc.

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
SRS.01.02_43	The ATMS TDR software shall calculate antenna temperatures with the per channel antenna temperature accuracy limits of 1 deg K for channels 1-2 and channels 16-22; 0.75 K for channels 3-15.	P	TDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Test	NA
SRS.01.02_85	The ATMS SDR software shall calculate brightness temperatures with the per channel brightness temperature accuracy limits of 1 deg K for channels 1-2 and channels 16-22; 0.75 K for channels 3-15.	P	SDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Test	NA
SRS.01.02_87	The ATMS SDR software shall calculate the warm noise equivalent differential temperature (NeDT) with the per channel 300K NeDT limits of 0.7 deg K for channels 1 and 4-9; 0.8 K for channels 2 and 18-21; 0.9 K for channels 3 and 22; 0.75 K for channel 10; 1.2 K for channels 11-12; 1.5 K for channel 13; 2.4 K for channel 14; 3.6 K for channel 15; 0.5 K for channel 16; and 0.6 K for channel 17.	P	SDR	S-NPP JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Test	NA
SRS.01.02_739	The ATMS TDR software shall calculate antenna temperatures with a dynamic range of 0-330 Kelvin at all channels.	P	TDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Test	NA
SRS.01.02_79	The ATMS TDR software shall	P	TDR	JPSS-1	algorithm	2.0.0	3.0.0	Test	NA

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
	deliver effective fields of view along track of 5.2 deg for channels 1 and 2; 2.2 deg for channels 3-16; and 1.1 deg for channels 17-22.			JPSS-2	provider				
SRS.01.02_738	The ATMS TDR software shall deliver effective fields of view cross-track of 6.3 deg for channels 1 and 2; 3.3 deg for channels 3-16; and 2.2 deg for channels 17-22.	P	TDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Test	NA
SRS.01.02_864	The ATMS SDR Geolocation algorithm computation shall have a 3 sigma mapping uncertainty of 5 km.	P	GEO	S-NPP JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Test	NA
SRS.01.02_41	The ATMS TDR software shall incorporate a computing algorithm provided for antenna temperatures.	Ap	TDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA
SRS.01.02_44	The ATMS TDR software shall incorporate a computing algorithm provided for evaluating the effect of the moon on the space view calibration.	Ap	TDR	S-NPP JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA
SRS.01.02_83	The ATMS SDR software shall incorporate a computing algorithm provided for brightness temperatures.	Ap	SDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA
SRS.01.02_86	The ATMS SDR software shall incorporate a computing algorithm provided for warm NeDT values.	Ap	SDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA
SRS.01.02_89	The ATMS SDR software shall incorporate a computing algorithm provided for cold NeDT values.	Ap	SDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA
SRS.01.02_91	The ATMS SDR software shall incorporate a computing algorithm provided for gain values.	Ap	SDR	JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
SRS.01.02_93	The ATMS SDR software shall incorporate a computing algorithm provided for evaluating the effect of the moon on the space view calibration.	Ap	SDR	S-NPP JPSS-1 JPSS-2	algorithm provider	2.0.0	3.0.0	Inspection	NA
SRS.01.02_737	The ATMS TDR software shall incorporate a computing algorithm provided for calibrated radiances.	Ap	TDR	S-NPP JPSS-1 JPSS-2	algorithm provider	2.1.0	3.0.0	NA	Inspection
SRS.01.02_45	The ATMS TDR software shall set <FillField> to indicated <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <TDR><fill>.	E	TDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_95	The ATMS SDR software shall set <FillField> to indicated <FillValue> for <FillCondition> specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <SDR><fill>.	E	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_48	The ATMS TDR software shall incorporate inputs specified in Table 3.3.1-1.	I	TDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_99	The ATMS SDR software shall incorporate inputs specified in Table 3.3.1-1.	I	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_157	The ATMS SDR geolocation software shall incorporate inputs per Table 3.3.1-1.	I	GEO	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_862	The ATMS SDR software shall ingest tables and coefficients formatted in accordance with Section 7 of the JPSS	Ft	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
	Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).								
SRS.01.02_47	The ATMS TDR software shall generate the ATMS TDR product in conformance with the XML format file in Attachment A.5 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).	F	TDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_98	The ATMS SDR software shall generate the ATMS SDR product in conformance with the XML format file in Attachment A.4 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).	F	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_138	The ATMS RDR software shall generate the ATMS Science RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Science>.	F	RDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_139	The ATMS RDR software shall generate the ATMS Diagnostic RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Diagnostic>.	F	RDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_140	The ATMS RDR software shall	F	RDR	S-NPP	CGS	2.0.0	3.0.0	Inspection	NA

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
	generate the ATMS Dwell RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Dwell>.			JPSS-1 JPSS-2					
SRS.01.02_141	The ATMS RDR software shall generate the ATMS Telemetry RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><Telemetry>.	F	RDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_142	The ATMS RDR software shall generate the ATMS Memory Dump RDR from mission data packet APIDs specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <RDR><MemoryDump>.	F	RDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_153	The ATMS TDR software shall use the ATMS SDR geolocation.	Fg	GEO	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_155	The ATMS SDR software shall generate the SDR geolocation product in conformance with the XML format file in Attachment A.3 of the JPSS Algorithm Specification Vol II: Data Dictionary for ATMS RDR/TDR/SDR (474-00448-02-02).	Fg	GEO	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_54	The ATMS TDR software shall report for each <FlagScope> quality flags	Q	TDR	S-NPP JPSS-1	CGS	2.0.0	3.0.0	Inspection	NA

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
	using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <TDR><QF>.			JPSS-2					
SRS.01.02_105	The ATMS SDR software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV, SRSPF for ATMS RDR/TDR/SDR , (474-00448-04-02) <SDR><QF>.	Q	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_161	The ATMS SDR geolocation software shall report for each <FlagScope> quality flags using <FlagLogic> as specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) <SDR_GEO><QF>.	Q	GEO	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_50	The ATMS TDR software shall send data quality notifications to the operator according to logic specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <TDR> <Notifications>.	N	TDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_101	The ATMS SDR software shall send data quality notifications to the operator according to logic specified in the JPSS Algorithm Specification Vol IV: SRSPF for ATMS RDR/TDR/SDR (474-00448-04-02) for <SDR> <Notifications>.	N	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_731	The JPSS Common Ground System	Ai	TDR	S-NPP	CGS	2.0.0	3.0.0	Inspection	NA

Req ID	Requirement Text	Level 3 Type	Product Type	Mission Effectivity	Allocated To	Block Start	Block End	Block 2.0.0 VM	Block 2.1.0 VM
	shall execute the ATMS TDR algorithm.			JPSS-1 JPSS-2					
SRS.01.02_732	The JPSS Common Ground System shall execute the ATMS SDR algorithm.	Ai	SDR	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA
SRS.01.02_735	The JPSS Common Ground System shall execute the ATMS SDR geolocation algorithm.	Ai	GEO	S-NPP JPSS-1 JPSS-2	CGS	2.0.0	3.0.0	Inspection	NA